LEAP Occupational Analysis

State of Tennessee
Department of Economic and Community Development
Division of Research and Planning

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Introduction
The Occupation Index is a method to identify which occupations in Tennessee should be targeted by educational institutions in accordance with the Labor Education Alignment Program (LEAP).

This study provides an analysis of all occupations that require a post-secondary non-degree award or greater, of which there are 320. Analysis was conducted utilizing Economic Modeling Specialists International (EMSI). Incorporating several labor market metrics as inputs, this study identifies six indicators to show strengths and needs in Tennessee's workforce. These indicators are multiplied by other market factors including wages, growth, STEM, and cluster focus to create an occupational index score.

The complete index of occupations is provided as an attachment to this report.

Methodology

Inputs:

The strength score attempts to highlight occupations that:
1. have high wages,
2. are growing,
3. display growth due to circumstances unique to Tennessee,
4. are highly concentrated in Tennessee, and
5. are critical occupations for TNECD's targeted industry groups

The need score attempts to highlight occupations that:
1. have high wages
2. are growing, but not at a rate that would align with occupational and demographic expectations
3. have a low concentration in Tennessee
4. have a high number of openings
5. have decreased in net employment due to circumstances unique to Tennessee
6. are critical occupations for TNECD's targeted industry groups

Universe: 320 occupations for which the typical entry level education is a postsecondary non-degree award or greater.
Notably, STEM and STEM-related occupations account for 48.1 percent of the 320 occupations. This includes 94 STEM occupations and 60 STEM-related occupations.

Source: Economic Modeling Specialists International (EMSI).
Class of Worker: QCEW Employees
Dataset Version: 2014.3 Class of Worker
Accessed: November 2014

Indicators:

Strength Indicators (SI)

Need Indicators (NI)

The indicators are aggregated and then weighted based on the following 4 multipliers to magnify strength and need:

Growth Multiplier: a multiplier of 1.5 is applied to occupations where observed job growth from 2009-14 exceeded 10%

Wage Multiplier: a multiplier of 1.5 is applied to occupations that have an average hourly wage of $30.03 or higher. This is the average wage for occupations that require a post-secondary non-degree award or greater

STEM Multiplier: A multiplier of 2 is applied to STEM occupations and 1.5 to STEM-related occupations. The classification of STEM and STEM related occupations is based on the US Census Bureau and EMSI definitions.

Cluster Multiplier: a multiplier ranging from 1-10 is applied to occupations which are ranked in the top 25 of occupations for overall employment in one or more of TNECD's industry clusters. The figure used for the multiplier equals 1, plus the number of clusters for which it is highly ranked. For a complete list of TNECD clusters, see Appendix A.

A High Strength score indicates an occupation for which Tennessee has regional strengths based on the labor market indicators incorporated in this study.

A High Need score indicates an occupation for which Tennessee has gaps in the labor market based on labor market indicators incorporated in this study. These are occupations where increased workforce development efforts may support current and future industry growth.

Score Calculations:

Strength Score:

(SI_1 + SI_2) **x** (Growth Multiplier + Wage Multiplier + STEM Multiplier) **x** (Cluster Multiplier) = **Total**

Need Score:

(NI_1 + NI_2 + NI_3 + NI_4) **x** (Growth Multiplier + Wage Multiplier + STEM Multiplier) **x** (Cluster Multiplier) = **Total**

Strength Indicator No. 1

Occupations which are High Wage, and Growing due to Unique Tennessee Trends

This table contains all high-wage occupations in the occupations universe that have had a net 5-year job increase AND Tennessee's competitive effect contributed to that increase.

These occupations are high wage and growing, indicating desirable and high quality jobs. The positive competitive effect indicates the actual growth surpassed expected growth due to regional characteristics. These occupations are part of a competitive workforce to support Tennessee industries.

SOC	Description	2014 Jobs	Actual Change 2009-14 %	Actual Change 2009-14	Expected Change[1]	Competitive Effect[2]	2013 Avg. Hourly Earnings[3]
13-2011	Accountants and Auditors	21,125	11%	2,045	1,268	777	$30.71
11-3031	Financial Managers	12,297	9%	1,015	471	544	$49.07
17-2112	Industrial Engineers	7,054	17%	1,014	490	525	$39.60
41-4011	Sales Representatives, Wholesale and Manufacturing, Technical and Scientific Products	9,603	12%	995	537	458	$38.53
11-1011	Chief Executives	7,982	9%	627	316	310	$75.51
17-2051	Civil Engineers	4,607	12%	511	236	275	$42.86
11-2022	Sales Managers	8,050	10%	730	468	261	$47.59
11-1021	General and Operations Managers	42,463	8%	3,027	2,782	245	$47.28
15-1121	Computer Systems Analysts	9,426	17%	1,398	1,153	244	$36.37
17-2071	Electrical Engineers	2,630	13%	301	74	227	$41.95
11-3011	Administrative Services Managers	6,898	9%	582	391	191	$34.53
29-1151	Nurse Anesthetists	2,561	16%	359	172	187	$69.72
11-3121	Human Resources Managers	2,689	17%	383	237	146	$41.60
15-1142	Network and Computer Systems Administrators	6,021	10%	532	387	145	$32.43
11-3061	Purchasing Managers	2,040	14%	245	101	144	$40.72
15-1131	Computer Programmers	4,756	12%	515	381	135	$36.37
11-3051	Industrial Production Managers	4,560	7%	287	174	114	$43.43
17-2161	Nuclear Engineers	941	16%	130	18	112	$64.42
11-9033	Education Administrators, Postsecondary	2,825	8%	207	110	96	$41.37
29-1131	Veterinarians	1,248	16%	171	87	84	$42.20
29-1171	Nurse Practitioners	4,433	15%	585	504	81	$44.42
11-9111	Medical and Health Services Managers	7,476	9%	628	548	79	$42.84
11-9021	Construction Managers	4,849	4%	180	101	78	$38.69

[1] Tennessee's expected change in jobs from 2009-14 due to a combination of nationwide trends in occupational mix, demographic trends, and national growth effect

[2] Competitive effect is the difference between the expected change and the actual observed change. It explains how much of the employment change for a given occupation is due to some unique competitive factors that the region possesses, because the change cannot be explained by national trends for that occupation or the economy as whole. A negative competitive effect means that job growth for a given occupation did not meet the expected growth. A positive competitive effect means that job growth exceeded expected growth for a given occupation.

[3] High-wage occupations are those that have an average hourly wage of more than $30.03, the average wage for occupations that require a post-secondary degree of any type

SOC	Description	2014 Jobs	Actual Change 2009-14 %	Actual Change 2009-14	Expected Change[1]	Competitive Effect[2]	2013 Avg. Hourly Earnings[3]
11-9041	Architectural and Engineering Managers	2,721	8%	196	118	77	$53.08
17-2199	Engineers, All Other	1,849	11%	182	104	77	$35.43
19-4051	Nuclear Technicians	548	23%	104	29	75	$33.21
11-2021	Marketing Managers	3,253	11%	335	268	68	$48.22
49-2095	Electrical and Electronics Repairers, Powerhouse, Substation, and Relay	631	14%	76	7	68	$31.37
11-3131	Training and Development Managers	935	16%	129	67	63	$40.76
17-2111	Health and Safety Engineers, Except Mining Safety Engineers and Inspectors	846	13%	100	41	58	$36.38
17-2141	Mechanical Engineers	4,310	9%	369	318	51	$39.52
29-2021	Dental Hygienists	3,469	11%	337	288	50	$30.12
53-5021	Captains, Mates, and Pilots of Water Vessels	1,089	13%	129	82	47	$43.51
53-2021	Air Traffic Controllers	697	11%	67	23	44	$58.28
17-2011	Aerospace Engineers	444	12%	47	8	40	$52.22
13-1081	Logisticians	2,037	17%	302	263	38	$30.82
29-9011	Occupational Health and Safety Specialists	1,579	9%	130	92	38	$30.43
11-3111	Compensation and Benefits Managers	473	13%	53	25	28	$41.76
29-1081	Podiatrists	123	38%	34	5	28	$65.06
17-2131	Materials Engineers	385	12%	40	17	23	$40.55
19-2032	Materials Scientists	256	15%	33	10	23	$40.88
19-2012	Physicists	494	9%	39	17	21	$49.84
29-1041	Optometrists	502	19%	79	59	20	$50.14
11-3021	Computer and Information Systems Managers	5,408	10%	494	483	12	$52.13
41-9031	Sales Engineers	883	8%	67	57	11	$48.38
17-2151	Mining and Geological Engineers, Including Mining Safety Engineers	87	32%	21	10	10	$35.02
15-1111	Computer and Information Research Scientists	448	15%	57	48	8	$35.40
53-5031	Ship Engineers	351	8%	26	20	5	$31.54
29-1022	Oral and Maxillofacial Surgeons	169	8%	13	9	4	$115.97
11-9061	Funeral Service Managers	189	6%	10	6	3	$49.81
19-2099	Physical Scientists, All Other	265	3%	8	5	3	$52.07
17-3021	Aerospace Engineering and Operations Technicians	74	1%	1	(2)	3	$31.37
17-2031	Biomedical Engineers	389	13%	44	43	2	$40.79
29-1029	Dentists, All Other Specialists	67	5%	3	3	1	$110.70

Strength Indicator No. 2

Occupations Critical to TNECD's Targeted Industries that have a High Regional Concentration

These occupations rank in the top 25 for industry employment according to national industry patterns in at least one of TNECD's targeted industry clusters, and have a high regional employment concentration as indicated by a location quotient of greater than 1.

Based on national industry trends, these occupations are important components of the workforce supporting TNECD's target industries. Tennessee's high regional concentration in these occupations represents a strength in the state's workforce. Encouraging further specialization in these occupations will prepare the state's workforce for future growth.

SOC	Description	2014 Jobs	2009-14 Actual Change %	2013 Avg. Hourly Earnings	2014 Location Quotient[4]	No. of ECD Clusters[5]
11-1021	General and Operations Managers	42,463	8%	$47.28	1.04	10
17-2112	Industrial Engineers	7,054	17%	$39.60	1.48	8
51-1011	First-Line Supervisors of Production and Operating Workers	14,276	4%	$25.87	1.20	8
11-2022	Sales Managers	8,050	10%	$47.59	1.10	8
17-3026	Industrial Engineering Technicians	1,933	13%	$26.66	1.38	7
11-3051	Industrial Production Managers	4,560	7%	$43.43	1.35	7
11-3031	Financial Managers	12,297	9%	$49.07	1.19	7
11-1011	Chief Executives	7,982	9%	$75.51	1.54	6
41-4011	Sales Representatives, Wholesale and Manufacturing, Technical and Scientific Products	9,603	12%	$38.53	1.30	5
53-3032	Heavy and Tractor-Trailer Truck Drivers	50,700	11%	$19.41	1.53	4
11-3011	Administrative Services Managers	6,898	9%	$34.53	1.24	3
11-3121	Human Resources Managers	2,689	17%	$41.60	1.16	3
11-3061	Purchasing Managers	2,040	14%	$40.72	1.42	2
17-2161	Nuclear Engineers	941	16%	$64.42	2.78	1
29-2012	Medical and Clinical Laboratory Technicians	6,271	23%	$17.15	1.94	1
53-5021	Captains, Mates, and Pilots of Water Vessels	1,089	13%	$43.51	1.64	1
19-1012	Food Scientists and Technologists	520	16%	$29.58	1.58	1
27-3011	Radio and Television Announcers	922	(11%)	$17.05	1.51	1
29-2035	Magnetic Resonance Imaging Technologists	979	9%	$27.85	1.50	1
49-2091	Avionics Technicians	484	59%	$24.23	1.39	1
49-2095	Electrical and Electronics Repairers, Powerhouse, Substation, and Relay	631	14%	$31.37	1.34	1
19-4031	Chemical Technicians	1,742	10%	$23.61	1.32	1
27-1027	Set and Exhibit Designers	252	(3%)	$28.86	1.29	1

[4] Location quotient (LQ): Ratio of proportion of an area's employment for an occupation to that of the nation as a whole. LQ is a way of quantifying how concentrated a particular occupation is in a region as compared to the nation. LQ=1: national average; LQ>1: occupation composes a greater share of the local area employment than the national average (indicating strong concentration or specialization); LQ<1: occupation composes a smaller share of the local area employment than the national average.

[5] The No. of ECD Clusters column shows how many clusters for which an occupation ranks in the top 25 for employment. See Appendix B for complete list of TNECD's targeted industries.

SOC	Description	2014 Jobs	2009-14 Actual Change %	2013 Avg. Hourly Earnings	2014 Location Quotient[4]	No. of ECD Clusters[5]
31-9097	Phlebotomists	2,864	16%	$12.36	1.29	1
29-2011	Medical and Clinical Laboratory Technologists	4,238	8%	$27.66	1.29	1
29-2034	Radiologic Technologists	5,052	9%	$23.55	1.27	1
29-2032	Diagnostic Medical Sonographers	1,540	18%	$28.56	1.26	1
49-9021	Heating, Air Conditioning, and Refrigeration Mechanics and Installers	6,514	7%	$18.93	1.24	1
29-9011	Occupational Health and Safety Specialists	1,579	9%	$30.43	1.22	1
11-9111	Medical and Health Services Managers	7,476	9%	$42.84	1.21	1
49-2022	Telecommunications Equipment Installers and Repairers, Except Line Installers	5,182	3%	$21.98	1.20	1
27-4014	Sound Engineering Technicians	306	(17%)	$25.89	1.20	1
17-3027	Mechanical Engineering Technicians	1,131	17%	$25.93	1.20	1
27-4011	Audio and Video Equipment Technicians	1,356	2%	$19.57	1.18	1
29-1069	Physicians and Surgeons, All Other	6,783	5%	$106.84	1.07	1
45-2011	Agricultural Inspectors	321	3%	$20.40	1.04	1

Need Indicator No. 1

Occupations which are High Wage and Growing, Despite Inhibiting Tennessee Trends

This table includes all high-wage occupations that require a post-secondary non-degree award or greater that have had a net 5-year job increase BUT Tennessee's regional competitive effect negatively impacted that growth.

These occupations are high wage and growing, indicating desirable and high quality jobs. However, the negative competitive effect indicates the expected growth was not achieved due to regional characteristics. For these occupations, an opportunity exists to create more growth and increase Tennessee's competitiveness.

SOC	Description	2014 Jobs	2009-14 Actual Change	2009-14 Actual Change %	Expected Change[6]	Competitive Effect[7]	2013 Avg. Hourly Earnings[8]
15-1132	Software Developers, Applications	5,365	445	9%	788	(344)	$39.02
29-1123	Physical Therapists	4,255	204	5%	542	(338)	$38.42
13-1111	Management Analysts	7,031	296	4%	604	(308)	$37.30
15-1133	Software Developers, Systems Software	3,009	206	7%	334	(128)	$40.29
15-1199	Computer Occupations, All Other	2,169	45	2%	124	(79)	$31.87
29-1069	Physicians and Surgeons, All Other	6,783	335	5%	414	(79)	$106.84
19-2041	Environmental Scientists and Specialists, Including Health	1,460	13	1%	88	(75)	$32.91
13-2051	Financial Analysts	2,922	147	5%	204	(58)	$38.36
15-1143	Computer Network Architects	1,338	40	3%	95	(56)	$44.96
29-1071	Physician Assistants	1,380	143	12%	197	(54)	$43.70
15-1141	Database Administrators	1,582	97	7%	132	(36)	$36.92
17-2081	Environmental Engineers	896	19	2%	54	(36)	$43.47
15-2031	Operations Research Analysts	1,396	144	12%	173	(30)	$31.95
29-1021	Dentists, General	973	27	3%	56	(29)	$91.53
29-1063	Internists, General	738	3	0%	30	(27)	$83.72
17-2061	Computer Hardware Engineers	630	13	2%	39	(25)	$41.12
29-1067	Surgeons	929	51	6%	76	(25)	$113.60
29-1181	Audiologists	213	11	5%	33	(22)	$30.82
13-2052	Personal Financial Advisors	1,850	164	10%	182	(18)	$54.50
29-1061	Anesthesiologists	539	29	6%	46	(17)	$120.01
15-2041	Statisticians	446	41	10%	58	(16)	$31.33

[6] Tennessee's expected change in jobs from 2009-14 due to a combination of nationwide trends in occupational mix, demographic trends, and national growth effect

[7] Competitive effect is the difference between the expected change and the actual observed change. It explains how much of the employment change for a given occupation is due to some unique competitive factors that the region possesses, because the change cannot be explained by national trends for that occupation or the economy as whole. A negative competitive effect means that job growth for a given occupation did not meet the expected growth. A positive competitive effect means that job growth exceeded expected growth for a given occupation.

[8] High-wage occupations are those that have an average hourly wage of more than $30.03, the average wage for occupations that require a post-secondary degree of any type

SOC	Description	2014 Jobs	2009-14 Actual Change	2009-14 Actual Change %	Expected Change[6]	Competitive Effect[7]	2013 Avg. Hourly Earnings[8]
29-2091	Orthotists and Prosthetists	104	4	4%	19	(16)	$39.33
29-1062	Family and General Practitioners	1,335	44	3%	58	(14)	$74.68
13-1011	Agents and Business Managers of Artists, Performers, and Athletes	512	48	10%	61	(12)	$31.33
29-1051	Pharmacists	8,063	227	3%	239	(12)	$56.12
15-2011	Actuaries	312	25	9%	36	(11)	$43.75
19-1021	Biochemists and Biophysicists	343	16	5%	26	(10)	$41.89
15-1122	Information Security Analysts	1,003	141	16%	149	(9)	$35.83
19-3039	Psychologists, All Other	184	6	3%	16	(9)	$40.08
17-2171	Petroleum Engineers	156	30	24%	36	(5)	$66.48
29-1064	Obstetricians and Gynecologists	338	8	2%	13	(5)	$96.31
29-1011	Chiropractors	313	20	7%	25	(5)	$39.77
19-1099	Life Scientists, All Other	73	0	0%	5	(4)	$40.65
11-9121	Natural Sciences Managers	660	15	2%	19	(4)	$53.37
11-2031	Public Relations and Fundraising Managers	1,141	77	7%	81	(4)	$40.19
19-2021	Atmospheric and Space Scientists	108	5	5%	6	(2)	$39.30
17-2121	Marine Engineers and Naval Architects	75	5	7%	7	(2)	$43.24
17-2021	Agricultural Engineers	36	1	3%	3	(2)	$39.71
11-2011	Advertising and Promotions Managers	673	46	7%	47	(1)	$36.18
19-3094	Political Scientists	44	4	10%	4	(1)	$32.08
19-1011	Animal Scientists	30	1	3%	2	(1)	$42.69

Need Indicator No. 2

Occupations Critical to TNECD's Targeted Industries that have a Low Regional Concentration

These occupations rank in the top 25 for industry employment according to national industry patterns in at least one of TNECD's targeted industry clusters, and have a low regional employment concentration as indicated by a location quotient of less than 1.

Based on national industry trends, these occupations are important components of the workforce supporting TNECD's target industries. However, Tennessee has a lower than average employment concentration when compared to the nation. There is room for improvement to increase regional specialization and concentration to support current and future business growth.

SOC	Description	2014 Jobs	2009-14 Actual Change %	2013 Avg. Hourly Earnings	2014 Location Quotient[9]	No. of ECD Clusters[10]
13-2011	Accountants and Auditors	21,125	11%	$30.71	0.85	10
13-1161	Market Research Analysts and Marketing Specialists	6,671	16%	$26.30	0.73	8
15-1121	Computer Systems Analysts	9,426	17%	$36.37	0.89	7
17-2141	Mechanical Engineers	4,310	9%	$39.52	0.80	7
15-1132	Software Developers, Applications	5,365	9%	$39.02	0.40	7
15-1133	Software Developers, Systems Software	3,009	7%	$40.29	0.38	7
13-1071	Human Resources Specialists	6,864	12%	$26.14	0.77	6
15-1142	Network and Computer Systems Administrators	6,021	10%	$32.43	0.81	6
11-9041	Architectural and Engineering Managers	2,721	8%	$53.08	0.72	6
17-2071	Electrical Engineers	2,630	13%	$41.95	0.76	5
13-1081	Logisticians	2,037	17%	$30.82	0.80	4
11-3021	Computer and Information Systems Managers	5,408	10%	$52.13	0.81	4
17-3023	Electrical and Electronics Engineering Technicians	2,655	7%	$26.29	0.92	4
13-1111	Management Analysts	7,031	4%	$37.30	0.59	4
19-2031	Chemists	1,062	(4%)	$34.83	0.59	4
11-2021	Marketing Managers	3,253	11%	$48.22	0.89	3
17-2199	Engineers, All Other	1,849	11%	$35.43	0.73	3
13-1151	Training and Development Specialists	4,370	8%	$29.18	0.94	3
17-3013	Mechanical Drafters	1,210	8%	$24.28	0.94	3
17-2072	Electronics Engineers, Except Computer	1,248	(3%)	$40.66	0.45	3
27-1024	Graphic Designers	2,924	(6%)	$20.62	0.74	3
19-1042	Medical Scientists, Except Epidemiologists	698	(16%)	$40.36	0.32	3
15-1131	Computer Programmers	4,756	12%	$36.37	0.74	2

[9] Location quotient (LQ): Ratio of proportion of an area's employment for an occupation to that of the nation as a whole. LQ is a way of quantifying how concentrated a particular occupation is in a region as compared to the nation. LQ=1: national average; LQ>1: occupation composes a greater share of the local area employment than the national average (indicating strong concentration or specialization); LQ<1: occupation composes a smaller share of the local area employment than the national average.

[10] The No. of ECD Clusters column shows how many clusters for which an occupation ranks in the top 25 for employment. See Appendix B for complete list of TNECD's targeted industries.

SOC	Description	2014 Jobs	2009-14 Actual Change %	2013 Avg. Hourly Earnings	2014 Location Quotient[9]	No. of ECD Clusters[10]
17-2011	Aerospace Engineers	444	12%	$52.22	0.30	2
17-2061	Computer Hardware Engineers	630	2%	$41.12	0.39	2
13-1041	Compliance Officers	4,601	1%	$28.41	0.94	2
49-3011	Aircraft Mechanics and Service Technicians	1,899	(5%)	$31.07	0.80	2
19-4021	Biological Technicians	891	(10%)	$21.43	0.61	2
51-9141	Semiconductor Processors	72	18%	$18.73	0.16	1
17-2031	Biomedical Engineers	389	13%	$40.79	0.89	1
17-2131	Materials Engineers	385	12%	$40.55	0.78	1
15-1134	Web Developers	1,371	10%	$27.33	0.58	1
41-9031	Sales Engineers	883	8%	$48.38	0.64	1
13-2051	Financial Analysts	2,922	5%	$38.36	0.56	1
19-1021	Biochemists and Biophysicists	343	5%	$41.89	0.56	1
19-4011	Agricultural and Food Science Technicians	401	4%	$17.53	0.92	1
11-9121	Natural Sciences Managers	660	2%	$53.37	0.61	1
17-3021	Aerospace Engineering and Operations Technicians	74	1%	$31.37	0.35	1
13-2031	Budget Analysts	697	(0%)	$32.11	0.58	1
27-3031	Public Relations Specialists	2,386	(1%)	$24.57	0.57	1
17-2041	Chemical Engineers	650	(1%)	$44.69	0.94	1
27-3043	Writers and Authors	539	(2%)	$22.31	0.61	1
27-1011	Art Directors	304	(4%)	$36.71	0.46	1
27-4012	Broadcast Technicians	462	(4%)	$17.32	0.82	1
27-3021	Broadcast News Analysts	75	(5%)	$29.52	0.76	1
27-1014	Multimedia Artists and Animators	189	(6%)	$27.32	0.31	1
19-1022	Microbiologists	200	(7%)	$28.19	0.48	1
27-3041	Editors	1,214	(11%)	$23.69	0.62	1
27-2012	Producers and Directors	1,055	(12%)	$32.74	0.58	1
27-4031	Camera Operators, Television, Video, and Motion Picture	233	(16%)	$25.39	0.73	1
27-3022	Reporters and Correspondents	704	(17%)	$16.64	0.82	1
27-4032	Film and Video Editors	307	(29%)	$29.75	0.77	1

Need Indicator No. 3

Occupations Which Have High Wages and a High Number of Openings, But a Low Regional Concentration

This table includes occupations with high wages and a location quotient of less than 1. Additionally, occupations that have at least 50 annual openings are included.

This table contains high wage jobs where there are a considerable amount of annual openings due to job growth and turnover. While openings may represent high employer demand for these occupations, the state's regional concentration is low relative to the nation. There is sufficient demand in these high paying occupations to support workforce development investment.

SOC	Description	2014 Jobs	2009–14 Actual Change %	2014 Location Quotient[11]	Annual Openings[12]	2013 Avg. Hourly Earnings[13]
13-2011	Accountants and Auditors	21,125	11%	0.85	1,067	$30.71
15-1121	Computer Systems Analysts	9,426	17%	0.89	416	$36.37
17-2051	Civil Engineers	4,607	12%	0.84	223	$42.86
15-1131	Computer Programmers	4,756	12%	0.74	220	$36.37
17-2141	Mechanical Engineers	4,310	9%	0.80	219	$39.52
13-1111	Management Analysts	7,031	4%	0.59	200	$37.30
15-1142	Network and Computer Systems Administrators	6,021	10%	0.81	198	$32.43
11-3021	Computer and Information Systems Managers	5,408	10%	0.81	174	$52.13
15-1132	Software Developers, Applications	5,365	9%	0.40	157	$39.02
29-2021	Dental Hygienists	3,469	11%	0.88	152	$30.12
23-1011	Lawyers	6,868	(1%)	0.56	144	$52.04
11-2021	Marketing Managers	3,253	11%	0.89	140	$48.22
17-2071	Electrical Engineers	2,630	13%	0.76	123	$41.95
11-9041	Architectural and Engineering Managers	2,721	8%	0.72	110	$53.08
13-2051	Financial Analysts	2,922	5%	0.56	105	$38.36
41-3031	Securities, Commodities, and Financial Services Sales Agents	3,667	(4%)	0.56	100	$43.93
15-1133	Software Developers, Systems Software	3,009	7%	0.38	84	$40.29
13-1081	Logisticians	2,037	17%	0.80	82	$30.82
29-1122	Occupational Therapists	1,754	(10%)	0.79	72	$37.28
17-2199	Engineers, All Other	1,849	11%	0.73	69	$35.43

[11] Location quotient (LQ): Ratio of proportion of an area's employment for an occupation to that of the nation as a whole. LQ is a way of quantifying how concentrated a particular occupation is in a region as compared to the nation. LQ=1: national average; LQ>1: occupation composes a greater share of the local area employment than the national average (indicating strong concentration or specialization); LQ<1: occupation composes a smaller share of the local area employment than the national average.

[12] Annual Openings are an estimate of labor market demand. Openings are positions made available as result of job growth and also through retirement and other forms of turnover.

[13] High-wage occupations are those that have an average hourly wage of more than $30.03, the average wage for occupations that require a post-secondary degree of any type

SOC	Description	2014 Jobs	2009–14 Actual Change %	2014 Location Quotient[11]	Annual Openings[12]	2013 Avg. Hourly Earnings[13]
29-1127	Speech-Language Pathologists	2,087	(4%)	0.83	67	$30.92
13-2052	Personal Financial Advisors	1,850	10%	0.48	63	$54.50
49-3011	Aircraft Mechanics and Service Technicians	1,899	(5%)	0.80	63	$31.07
15-2031	Operations Research Analysts	1,396	12%	0.91	58	$31.95
29-1071	Physician Assistants	1,380	12%	0.75	54	$43.70
19-2041	Environmental Scientists and Specialists, Including Health	1,460	1%	0.80	54	$32.91
15-1199	Computer Occupations, All Other	2,169	2%	0.53	54	$31.87
15-1141	Database Administrators	1,582	7%	0.67	50	$36.92
13-2041	Credit Analysts	1,336	5%	0.99	50	$31.42

Need Indicator No. 4

Occupations Projected to Increase in National Forecasts That Decreased Due to Inhibiting Tennessee Trends

This table contains occupations where the expected change, which is based on nationwide occupational and demographic trends, was projected to increase net employment over the five year period from 2009-2014. However, the competitive effect was so sharply negative that it produced a decrease in net employment rather than an increase.

A negative competitive effect for these occupations indicates unique regional factors may be driving the decrease in net employment. Workforce development for these occupations would improve Tennessee's competitiveness and support businesses requiring this workforce.

SOC	Description	2009 Jobs	2014 Jobs	2009-2014 Actual Change	Expected Change[14]	Competitive Effect[15]
29-1122	Occupational Therapists	1,957	1,754	(203)	205	(407)
23-1011	Lawyers	6,939	6,868	(71)	163	(234)
21-1023	Mental Health and Substance Abuse Social Workers	1,540	1,461	(79)	157	(236)
27-3031	Public Relations Specialists	2,400	2,386	(14)	154	(168)
29-1127	Speech-Language Pathologists	2,163	2,087	(76)	142	(217)
29-1126	Respiratory Therapists	3,439	3,298	(141)	114	(255)
49-3011	Aircraft Mechanics and Service Technicians	1,993	1,899	(94)	83	(177)
19-3031	Clinical, Counseling, and School Psychologists	1,302	1,211	(91)	67	(158)
21-1099	Community and Social Service Specialists, All Other	1,012	956	(56)	64	(120)
13-2099	Financial Specialists, All Other	1,662	1,661	(1)	60	(61)
19-4021	Biological Technicians	990	891	(99)	45	(145)
27-1024	Graphic Designers	3,102	2,924	(178)	46	(223)
27-2012	Producers and Directors	1,202	1,055	(147)	42	(189)
19-1042	Medical Scientists, Except Epidemiologists	831	698	(133)	40	(172)
25-2021	Elementary School Teachers, Except Special Education	25,666	25,650	(16)	39	(55)
19-2031	Chemists	1,104	1,062	(42)	39	(80)
21-1029	Social Workers, All Other	863	845	(18)	33	(52)
29-1124	Radiation Therapists	514	511	(3)	32	(35)
17-2041	Chemical Engineers	655	650	(5)	29	(34)
53-2011	Airline Pilots, Copilots, and Flight Engineers	1,050	635	(415)	27	(442)
25-2059	Special Education Teachers, All Other	869	837	(32)	22	(54)
13-2031	Budget Analysts	698	697	(1)	21	(21)

[14] Tennessee's expected change in jobs from 2009-14 due to a combination of nationwide trends in occupational mix, demographic trends, and national growth effect

[15] Competitive effect is the difference between the expected change and the actual observed change. It explains how much of the employment change for a given occupation is due to some unique competitive factors that the region possesses, because the change cannot be explained by national trends for that occupation or the economy as whole. A negative competitive effect means that job growth for a given occupation did not meet the expected growth. A positive competitive effect means that job growth exceeded expected growth for a given occupation.

SOC	Description	2009 Jobs	2014 Jobs	2009-2014 Actual Change	Expected Change[14]	Competitive Effect[15]
27-3043	Writers and Authors	549	539	(10)	19	(29)
29-1066	Psychiatrists	314	269	(45)	19	(64)
27-1014	Multimedia Artists and Animators	200	189	(11)	18	(29)
27-1027	Set and Exhibit Designers	259	252	(7)	17	(25)
29-1199	Health Diagnosing and Treating Practitioners, All Other	244	236	(8)	18	(25)
29-1065	Pediatricians, General	388	387	(1)	18	(18)
27-1011	Art Directors	316	304	(12)	16	(28)
43-9111	Statistical Assistants	222	213	(9)	12	(22)
29-1129	Therapists, All Other	111	96	(15)	13	(27)
29-1125	Recreational Therapists	372	320	(52)	12	(64)
27-1022	Fashion Designers	265	236	(29)	11	(40)
25-9099	Education, Training, and Library Workers, All Other	1,418	1,413	(5)	12	(16)
17-2072	Electronics Engineers, Except Computer	1,292	1,248	(44)	10	(55)
19-3011	Economists	121	92	(29)	9	(38)
19-1022	Microbiologists	214	200	(14)	8	(23)
19-3099	Social Scientists and Related Workers, All Other	341	324	(17)	8	(25)
27-4031	Camera Operators, Television, Video, and Motion Picture	276	233	(43)	5	(49)
27-1025	Interior Designers	732	704	(28)	7	(34)
13-2061	Financial Examiners	552	472	(80)	6	(85)
19-1023	Zoologists and Wildlife Biologists	133	125	(8)	3	(12)
13-1032	Insurance Appraisers, Auto Damage	127	113	(14)	3	(17)
17-1012	Landscape Architects	302	287	(15)	2	(17)
19-2043	Hydrologists	50	48	(2)	2	(4)
11-9161	Emergency Management Directors	186	185	(1)	1	(2)

Multipliers: High Growth, High Wage Occupations

These occupations have grown by more than 10% over the previous 5 years and pay an average hourly wage that is above average for occupations that require at least a post-secondary non-degree award. Occupations in the table below are included in both the Wage Multiplier and the Growth Multiplier.

SOC	Description	2014 Jobs	2009 -2014 Actual Change %	2013 Avg. Hourly Earnings
13-2011	Accountants and Auditors	21,125	11%	$30.71
41-4011	Sales Representatives, Wholesale and Manufacturing, Technical and Scientific Products	9,603	12%	$38.53
15-1121	Computer Systems Analysts	9,426	17%	$36.37
11-2022	Sales Managers	8,050	10%	$47.59
17-2112	Industrial Engineers	7,054	17%	$39.60
15-1142	Network and Computer Systems Administrators	6,021	10%	$32.43
11-3021	Computer and Information Systems Managers	5,408	10%	$52.13
15-1131	Computer Programmers	4,756	12%	$36.37
17-2051	Civil Engineers	4,607	12%	$42.86
29-1171	Nurse Practitioners	4,433	15%	$44.42
29-2021	Dental Hygienists	3,469	11%	$30.12
11-2021	Marketing Managers	3,253	11%	$48.22
11-3121	Human Resources Managers	2,689	17%	$41.60
17-2071	Electrical Engineers	2,630	13%	$41.95
29-1151	Nurse Anesthetists	2,561	16%	$69.72
11-3061	Purchasing Managers	2,040	14%	$40.72
13-1081	Logisticians	2,037	17%	$30.82
13-2052	Personal Financial Advisors	1,850	10%	$54.50
17-2199	Engineers, All Other	1,849	11%	$35.43
15-2031	Operations Research Analysts	1,396	12%	$31.95
29-1071	Physician Assistants	1,380	12%	$43.70
29-1131	Veterinarians	1,248	16%	$42.20
53-5021	Captains, Mates, and Pilots of Water Vessels	1,089	13%	$43.51
15-1122	Information Security Analysts	1,003	16%	$35.83
17-2161	Nuclear Engineers	941	16%	$64.42
11-3131	Training and Development Managers	935	16%	$40.76
17-2111	Health and Safety Engineers, Except Mining Safety Engineers and Inspectors	846	13%	$36.38
53-2021	Air Traffic Controllers	697	11%	$58.28
49-2095	Electrical and Electronics Repairers, Powerhouse, Substation, and Relay	631	14%	$31.37
19-4051	Nuclear Technicians	548	23%	$33.21
13-1011	Agents and Business Managers of Artists, Performers, and Athletes	512	10%	$31.33
29-1041	Optometrists	502	19%	$50.14

SOC	Description	2014 Jobs	2009 -2014 Actual Change %	2013 Avg. Hourly Earnings
11-3111	Compensation and Benefits Managers	473	13%	$41.76
15-1111	Computer and Information Research Scientists	448	15%	$35.40
15-2041	Statisticians	446	10%	$31.33
17-2011	Aerospace Engineers	444	12%	$52.22
17-2031	Biomedical Engineers	389	13%	$40.79
17-2131	Materials Engineers	385	12%	$40.55
19-2032	Materials Scientists	256	15%	$40.88
17-2171	Petroleum Engineers	156	24%	$66.48
29-1081	Podiatrists	123	38%	$65.06
17-2151	Mining and Geological Engineers, Including Mining Safety Engineers	87	32%	$35.02
15-2021	Mathematicians	51	16%	$37.30
19-3094	Political Scientists	44	10%	$32.08
15-2091	Mathematical Technicians	23	10%	$31.45

Multipliers: Occupations that are in the Top 25 for Employment in Four or more TNECD Clusters

Occupations included in the table below appear among the top 25 occupations by industry for at least four of TNECD's targeted industries. National patterns determine the percentage of employment in a given industry for each occupation. Some occupations appear in many different clusters, such as accounting, financial, and managerial occupations. The more clusters an occupation appears in, the more intense the Cluster Multiplier will be in the occupational index.

SOC	Description	No. of Clusters
13-2011	Accountants and Auditors	10
11-1021	General and Operations Managers	10
17-2112	Industrial Engineers	8
11-2022	Sales Managers	8
13-1161	Market Research Analysts and Marketing Specialists	8
51-1011	First-Line Supervisors of Production and Operating Workers	8
15-1121	Computer Systems Analysts	7
11-3031	Financial Managers	7
11-3051	Industrial Production Managers	7
17-2141	Mechanical Engineers	7
17-3026	Industrial Engineering Technicians	7
15-1132	Software Developers, Applications	7
15-1133	Software Developers, Systems Software	7
11-1011	Chief Executives	6
11-9041	Architectural and Engineering Managers	6
15-1142	Network and Computer Systems Administrators	6
13-1071	Human Resources Specialists	6
41-4011	Sales Representatives, Wholesale and Manufacturing, Technical and Scientific Products	5
17-2071	Electrical Engineers	5
11-3021	Computer and Information Systems Managers	4
13-1081	Logisticians	4
53-3032	Heavy and Tractor-Trailer Truck Drivers	4
13-1111	Management Analysts	4
19-2031	Chemists	4
17-3023	Electrical and Electronics Engineering Technicians	4

Occupation Index Scores

Occupations with highest **Strength Score**

SOC	Description	STRENGTH	NEED
17-2112	Industrial Engineers	90	0
11-1021	General and Operations Managers	55	0
41-4011	Sales Representatives, Wholesale and Manufacturing, Technical and Scientific Products	48	0
11-2022	Sales Managers	45	0
13-2011	Accountants and Auditors	44	88
15-1121	Computer Systems Analysts	40	80
11-3031	Financial Managers	40	0
11-3051	Industrial Production Managers	40	0
11-1011	Chief Executives	35	0
11-3121	Human Resources Managers	32	0
17-2071	Electrical Engineers	30	60
17-2141	Mechanical Engineers	28	56
17-3026	Industrial Engineering Technicians	28	0

Occupations with highest **Need Score**

SOC	Description	STRENGTH	NEED
13-2011	Accountants and Auditors	44	88
15-1132	Software Developers, Applications	0	84
15-1133	Software Developers, Systems Software	0	84
15-1121	Computer Systems Analysts	40	80
17-2071	Electrical Engineers	30	60
17-2141	Mechanical Engineers	28	56
11-3021	Computer and Information Systems Managers	25	50
11-9041	Architectural and Engineering Managers	24.5	49
15-1142	Network and Computer Systems Administrators	24.5	49
17-2199	Engineers, All Other	20	40
13-1081	Logisticians	20	40
13-1111	Management Analysts	0	37.5
19-2031	Chemists	0	35

Note: Occupations in blue text indicate STEM occupations

Occupations with **High Strength** and **High Need**

Some occupations have high scores for both Strength and Need, signifying areas where Tennessee may generally have high wages and high growth, high concentration, and competitiveness; but also displays a need for further growth based on employment trends and projected industry growth. The occupations in the table below may represent the greatest opportunity for state educational institutions to emphasize in the near future.

SOC	Description	STRENGTH	NEED
13-2011	Accountants and Auditors	**44**	**88**
15-1121	Computer Systems Analysts	**40**	**80**
17-2071	Electrical Engineers	**30**	**60**
17-2141	Mechanical Engineers	**28**	**56**
11-3021	Computer and Information Systems Managers	**25**	**50**
11-9041	Architectural and Engineering Managers	**24.5**	**49**
15-1142	Network and Computer Systems Administrators	**24.5**	**49**
17-2199	Engineers, All Other	**20**	**40**
13-1081	Logisticians	**20**	**40**
11-2021	Marketing Managers	**16**	**32**
15-1131	Computer Programmers	**15**	**30**

Note: Occupations in blue text indicate STEM occupations

Appendix A: TNECD Target Industry Clusters

A business is placed into a cluster based on its ***primary business activity***. Below is a list of industries utilized for this study:

Cluster	NAICS Code	Industry Description
Aerospace & Defense	3364	Aerospace product and parts manufacturing
	334511	Search, Detection, Navigation, Guidance, Aeronautical, and Nautical System and Instrument Manufacturing
	336992	Military armored vehicle, tank, and tank component manufacturing
	332992	Small Arms Ammunition Manufacturing
	332993	Ammunition (except Small Arms) Manufacturing
	332994	Small Arms, Ordnance, and Ordnance Accessories Manufacturing
	488190	Other Support Activities for Air Transportation
Automotive	3361	Motor Vehicle Manufacturing
	3362	Motor Vehicle Body and Trailer Manufacturing
	3363	Motor Vehicle Parts Manufacturing
	32621	Tire Manufacturing (may also place these in Rubber, depending on business)
Chemicals, Plastics & Rubber	325	Chemical Manufacturing
	326	Plastics and Rubber Products Manufacturing
Transportation, Distribution & Logistics	42	Wholesale Trade
	481112	Scheduled Freight Air Transportation
	482	Rail Transportation
	483113	Coastal and Great Lakes Freight Transportation
	483211	Inland water freight Transportation
	484	Truck Transportation
	488	Support Activities for Transportation
	492	Couriers and Messengers
	493	Warehousing and Storage
Energy Technology	22111	Electric Power Generation
	22112	Electric Power Transmission, Control, and Distribution
	2212	Natural Gas Distribution
	324110	Petroleum Refineries
	332410	Power Boiler and Heat Exchanger Manufacturing
	333414	Heating Equipment (except Warm Air Furnaces) Manufacturing
	333415	Air-Conditioning and Warm Air Heating Equipment and Commercial and Industrial Refrigeration Equipment Manufacturing
	333611	Turbine and Turbine Generator Set Units Manufacturing
	3344	Semiconductor and Other Electronic Component Manufacturing
	334512	Automatic Environmental Control Manufacturing for Residential, Commercial, and Appliance Use
	334515	Instrument Manufacturing for Measuring and Testing Electricity and Electrical Signals
	33511	Electric Lamp Bulb and Part Manufacturing

Cluster	NAICS Code	Industry Description
	3353	Electrical Equipment Manufacturing
	33591	Battery Manufacturing
	33599	All Other Electrical Equipment and Component Mfg.
Food & Agribusiness	311	Food Manufacturing
	3121	Beverage Manufacturing
Healthcare & Medical Devices	334510	Electromedical and Electrotherapeutic Apparatus Manufacturing
	334516	Analytical Laboratory Instrument Manufacturing
	334517	Irradiation Apparatus Manufacturing
	3391	Medical Equipment and Supplies Manufacturing
	6215	Medical and Diagnostic Laboratories
Business Services (HQs, R&D, Datacenters, Call Centers)	518210	Data Processing, Hosting, and Related Services
	5417	Scientific Research and Development Services
	551114	Corporate, Subsidiary, and Regional Managing Offices
	561422	Telemarketing Bureaus and Other Contact Centers
	5614	Business Support Services
Manufacturing	31-33	
Entertainment & Media	512	Motion Picture and Sound Recording Industries
	515	Broadcasting (except Internet)
	339992	Musical Instrument Manufacturing
	71113	Musical Groups and Artists
	334613	Blank Magnetic and Optical Recording Media Manufacturing